

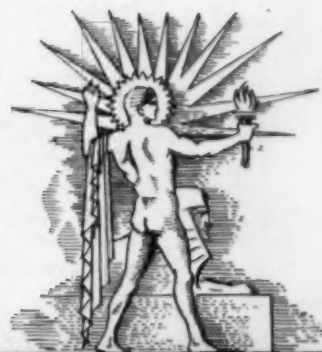
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MAR 23 1934

SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE •



MARCH 17, 1934

Johannes, Disciple of Patrick

See Page 166

A

SCIENCE SERVICE PUBLICATION

SCIENCE NEWS LETTER

VOL. XXV

No. 675

The Weekly  Current
Summary of Science

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DO YOU KNOW?

An oyster egg is about one five-hundredth of an inch in diameter.

Sea beans of the tropics sometimes float thousands of miles, turning up on the beaches of northern Europe.

Chemists have produced a concentrated apple juice that can be mixed with water to make a drink tasting like fresh apple juice.

At the 1851 exposition in London, gas lighting effects which illuminated the buildings were one of the spectacular attractions.

Two swords and several other relics of the Shang dynasty, twelfth century B.C., were recently found by a farmer in the northern province of Shansi, China.

In the ancient cities of Herculaneum and Pompeii, real estate advertisements were painted on the sides of buildings.

The average cigar contains about ten times as much tobacco as an ordinary cigarette, according to one weighing test.

A method of keeping orange juice in cold storage without sterilization has been perfected at the Florida Agricultural Experiment Station.

For every lower animal that scientists know that lived on earth in ancient times, there may have been a hundred that are not yet discovered.

Spanish explorers and colonizers not only carried fruits of the New World back to Europe, but brought figs, olives, and other Old World plants to the New.

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Who's afraid of the big, bad snake? p. 166. *Snakes of the World—Raymond L. Dismars—Macmillan, 1931, \$6.*

These curiosity-arousing questions show at a glance the wide field of scientific activity from which this week's news comes. Book references in italic type are not sources of information for the article, but the references for further reading. Books cited can be supplied by Book Department, Science News Letter, at publishers' prices, prepaid in the United States.

METEOROLOGY

Speed of Lightning Revealed By Unique Camera Set-Up

Main Discharge Travels Upward From Ground Following Path Established by Faint Downward Leader Stroke

HOW FAST does a thunderbolt travel? This question has been answered by Dr. B. F. J. Shonland of the Cape Town University, and H. Collins of the Victoria Falls and Transvaal Power Company.

Using a camera provided with two lenses revolving in a circle at opposite ends of a diameter, an arrangement described by C. V. Boys in 1926, the two experimenters photographed a number of lightning strokes between earth and cloud. A moving lens tilts the image of a lightning flash on the plate much as a focal plane shutter causes a swiftly moving automobile to seem to lean forward. The other lens, moving in the opposite direction, tilts the image the other way, so that the real angle of tilt is found as half the angle between the two images. Knowing the speed of the lenses, which made 1500 revolutions per minute, the experimenters could find not only the duration of the discharge, but which way it was going and how fast. They could determine also how long the luminosity persisted after the discharge had ceased, and other details.

Almost always, they found, the main flash was preceded by a faint "leader," as they call it. This traveled downward from the negatively charged cloud to the positively charged earth. As soon as it struck the earth, the main flash started upward from the same spot, and followed exactly the same path that the leader had taken, to the cloud.

The leaders were invariably thin, of uniform width, and unbranched. Their speeds ranged from 810 to 19,900 miles per second. They averaged 5,150 miles. The length of the strokes observed varied from 1.6 to 4.7 miles. The longest time occupied by a leader stroke was 1670 micro-seconds for a 4.7 mile stroke. The quickest flash took 69 micro-seconds to travel 3.5 miles. A micro-second is one millionth of a second.

The lengths of the strokes were measured along the crinkly paths registered on the plates. These did not show, of course, the motion toward or away from the camera, and the experimenters es-

timated that the real lengths of the strokes in space, and consequently the real velocities, were about 30 per cent. higher than those measured.

The leader appeared to be composed of an elongated dart. From the width of the track on the plate, the investigators were able to determine the duration of the luminosity at any point, and assuming that this was the time required for the dart to pass the point, they were able to measure the lengths of the darts. These varied from 80 to 370 feet, the average being 180 feet.

In conformity with the theory proposed by Dr. N. Ernest Dorsey in 1926, the authors believe that the leader consists of an "electron avalanche," which goes ahead and ionizes the air, thus preparing a conducting path for the main discharge that follows.

The main discharge is entirely different in character. It is thicker and brighter, and the thickness diminishes upward. It is more like a soaring flame than a moving dart. Also it travels faster. The speeds ranged from 14,900 to 68,400 miles per second, the average being 28,500 or about 15 per cent. of the speed of light.

Often the main upward discharges

were branched—but they branched downwards. After each branch the main stem thinned but did not pause in its upward motion. The branch occurred at or after the moment the head of the discharge passed the point. The branches did not always occur in regular sequence, a lower branch sometimes sprouting out after an upper branch had developed.

The time required for the discharge to reach the cloud varied from 44 to 65 micro-seconds. To reach the end of the last branch took from 40 to 145 micro-seconds. The bright luminosity at the base lasted from 12 to 164 micro-seconds. Usually it was out before the discharge reached the cloud, occasionally not. A faint luminosity, however, lasted much longer, sometimes as much as a fiftieth of a second, as though the path had been heated and continued to glow.

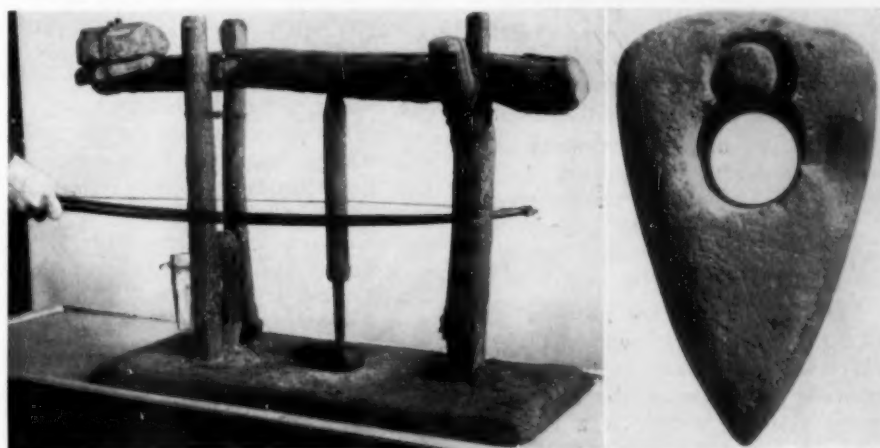
The experiments were made for the Lightning Investigation Committee of the South African Institute of Electrical Engineers, and are to be continued.

Science News Letter, March 17, 1934

ARCHAEOLOGY

Man a Machinist For 10,000 Years

BENJAMIN Franklin is credited with having originated the definition of man as a tool-making animal. But even the immortal Benjamin and all the eighteenth-century natural philosophers who were his peers might well have been astonished at the prehistoric extension which has been given to man's activities not merely at making tools but at making machinery for the mak-



NEW STONE AGE DRILL-PRESS AND DRILL-HOLES

Die Umschau

The drill-press was reconstructed by Prof. Wolfgang La Baume, of Danzig; the ax-head is an actual Neolithic specimen, with a badly-placed hole that was discontinued before it was completed, and a correctly-placed hole that was bored clean through. The core projecting in the first hole shows that a hollow tool—presumably a bone—was used.

ing of tools. Prof. Wolfgang La Baume, of the Danzig Museum of Natural History and Prehistory, after a careful study of pierced stone axes, hammers, hoes and other tools of the New Stone Age, has built of wood, sinew and other primitive materials a drill press that duplicates their technique quite exactly.

The apparatus is crude but efficient. A Y-forked tree limb driven into the ground supports a stout wooden cross beam weighted at its other end with a stone and free to move up and down between a pair of straight sticks that act as guides. In the middle of the cross beam a shallow hole or socket acts as a bearing for a smaller vertical stick, at the lower end of which is fitted a piece of bone or hardwood that serves as the drill itself. This vertical stick is free to twirl in its socket, and is set in motion by a bowstring, after the manner of the "fire-drill" familiar to all Boy Scouts. The drill is armed with an angular bit of flint, which can eat its way through a piece of bone, wood, or other material with surprising ease, says Prof. La Baume.

For making holes in stone, a procedure surprisingly reminiscent of the most modern metallurgy is used. Modern workers in very hard metals, that defy steel drills, can bore and cut them by

using abrasives such as diamond dust, emery and carborundum, on the face of a tool of softer material. So also did the Neolithic machinists, when they wanted to make a hole in a flint ax-head. They used a blunt-ended wooden drill, or the shaft of a deer leg-bone, to twist and twirl on top of a little wet sand.

Prof. La Baume, using this method on his reconstructed Neolithic drill-press, can bore clean holes through very hard stones in very short time and with surprisingly little wear on the bone or wooden tool. The solid wooden rod gives him a clear bore-hole, the hollow bone makes an annular cut and takes out a core. New Stone Age tools, discarded before completion because something went amiss, show both types of boring.

The Danzig archaeologist has also reconstructed a stone-cutting tool employing the same principle to slice straight grooves into flat pieces of hard rock, making "blanks" similar to those from which Neolithic men began shaping their polished stone implements.

Apparently the skilled artificers of medieval Nuremberg, and the craftsmen of the mighty modern works of Essen, can point back to at least ten thousand years of ancestor-machinists.

Science News Letter, March 17, 1934

ASTRONOMY

Nebulae Emptier Than Air; Metals Are Frigid Vapor

THE SPACE between the nebulae is a million times bigger than the space occupied by the nebulae. Yet one might say space is crowded with nebulae compared with the sparseness with which the stars are contained in the nebulae.

This is one of the astronomical facts recently presented by Dr. J. A. Anderson of the Mt. Wilson Observatory in a popular discussion held under the auspices of the Astronomical Society of the Pacific.

The average distance between stars in a nebula like our own galaxy, the milky way, is millions of times bigger than the diameters of the stars. This means that the nebula is a thousand billion billion times as big as the sum of all the stars in it. And there may be some hundreds of billions of stars in one nebula.

Thus a nebula is emptier than ordi-

nary air. If the molecules in a thimbleful of air were strung together side by side the string would go thirty times around the earth. If a similar string of stars were made it would extend only one-seventh across the nebula.

Between the stars there are gas molecules thinly dispersed. Even metals at the low temperatures of interstellar space exist as vapor because the molecules do not meet each other often enough to form solid matter at once. There is also a large amount of dust, as indicated by great clouds which hide all stars behind them. Dust is a hundred million times as opaque as gas.

So much starlight has been emitted since the beginning of the universe that its mass would be equivalent to a hundred galaxies. And there may be a hundred times as much in the form of cosmic radiation.

Science News Letter, March 17, 1934

AERONAUTICS-METEOROLOGY

Lightning Not Dangerous To Aircraft in Flight

LIGHTNING is not dangerous to aircraft in flight.

This is the conclusion of a group of authorities on meteorological and electrical conditions who, as subcommittee of the National Advisory Committee for Aeronautics, reported results of a thorough investigation made since the wreck of the airship *Akron*.

An airship inflated with inflammable hydrogen is no more liable to damage from lightning than one inflated with non-inflammable helium, provided it is properly "caged" with electrically conducting metal framework, the scientists found. Their report states that in the airship the protection is greater the closer the meshes of the metallic framework, the wire bracing, and the wire netting enclosing the gas bags, and particularly the more highly electrically conducting the surface of the outer envelope.

A number of reports of damage by lightning to airplanes were reviewed. It was generally agreed that, "It is possible, without serious complication, to render an airplane practically immune to serious danger either to the airplane or to the occupants."

Though neither airplanes nor airships are in serious danger from lightning, both must make every effort to avoid thunderstorms, the scientists cautioned. The extremely violent and turbulent winds of thunderstorms, rather than the lightning, are the cause of destruction, it was pointed out.

This study of "Hazards to Aircraft Due to Electrical Phenomena" was made at the request of the Navy Department. Members of the subcommittee, appointed by Dr. Joseph S. Ames, president of Johns Hopkins University and chairman of the National Advisory Committee, were: Dr. Charles F. Marvin, Weather Bureau, chairman; Dr. L. J. Briggs, Bureau of Standards; Commander Garland Fulton (C.C.), U.S.N.; Dr. W. J. Humphreys, Weather Bureau; Dr. J. C. Hunsaker, Massachusetts Institute of Technology; Dr. F. B. Silsbee, Bureau of Standards; Prof. John B. Whitehead, Johns Hopkins University; Dr. G. W. Lewis, National Advisory Committee for Aeronautics (ex officio). They were assisted by Dr. M. F. Peters of the Bureau of Standards.

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MODERN WATCH TIMING

A number of electric watch timers developed by Bell Telephone Laboratories have gone into service to do a ten-day regulating job in ten minutes. (SNL, May 27, '33, p. 325.) Correct time intervals furnished by wire from a constant frequency generator flash a lamp upon a mirror that reflects the image of the balance wheel. The wheel appears to remain stationary when the watch is running accurately.

ENDOCRINOLOGY

Energy of Dickens Due To Glandular Balance

FOR THE tremendous literary output of Charles Dickens, in many volumes treasured in literary households, including his "Life of Christ" now receiving first publication, we have to thank the excellent balance of his glandular system and the dominance of those glands which produce unusual energy, in the opinion of Dr. H. B. Fantham, Canadian biologist of McGill University, Montreal, who discusses the subject in the international journal, *Character and Personality*.

"The vigor, energy, persistence, and sympathy of Charles Dickens may be said to be due to good balance between his pituitary, adrenal, and thyroid glands, with the two latter, however, dominating," Dr. Fantham said.

"The influence on Charles Dickens of other glands of internal secretion such as the thymus, the gonads, and possibly the pineal, are not easy of estimation from the data available."

This diagnosis was based on records of Dickens' life, habits, and personality, descriptions of his physical appearance and his portraits.

Science News Letter, March 17, 1934

RADIO

Soviet Scientists Find Radio Roof Higher in Polar Regions

Hence Long Waves Travel Farther at Ends of Earth; Reflecting Surface Rough, Shielded by Radio "Clouds"

THE "RADIO ROOF" of the atmosphere, that electrified layer which reflects radio waves and makes possible long distance transmission, is higher in polar regions than in temperate latitudes, Prof. M. A. Bontch-Bruevitch, Soviet scientist, revealed in a report to *Nature*.

Experimenting at Murmansk, in the extreme northwestern portion of the U.S.S.R. near the Arctic Ocean, Prof. Bontch-Bruevitch discovered many unusual phenomena in connection with the fading of radio signals.

The height of the radio reflecting layer is ordinarily measured by sending radio signals and recording their reception on an oscillogram. If the receiver is within a short distance of the transmitter, two signals will come in, one direct from the ground wave and the other reflected by the radio roof as light is from a mirror. The time interval between the original signal and the echo gives an index to the height of the reflecting layer.

Two reflecting layers were found by the Soviet scientist in the polar regions, corresponding to the two layers found in England by Prof. E. V. Appleton, but the lower layer, known as the E layer, is not generally active so far north.

This means that at the ends of the earth, long wave radio signals ordinarily reflected by this lower layer will penetrate to the higher or F layer and hence travel greater distances than in temperate latitudes.

Very complex reflections from the upper region indicate that this part of the ionosphere has a stratified or undulatory structure, Prof. Bontch-Bruevitch reported.

Evidence was also found of radio-absorbing "clouds" or separate moving masses which pass along the radio-reflecting layer and prevent its reflection, as a cloud passing over the face of the moon prevents its light from reaching us.

When these radio "clouds" were

present, the echoes were entirely absent for a short time. Such clouds make up an absorbing layer, independent of the reflecting layers and comparatively low in height, probably less than 65 kilometers (37 miles) as compared with heights of the reflecting layers ranging on the average from 110 kilometers (68 miles) to 220 kilometers (136 miles) or higher.

There is undoubtedly direct connection between the echo cessation and magnetic activity, Prof. Bontch-Bruevitch believes.

"The difficulty caused by magnetic storms of maintaining continuous wireless communication over high latitudes may be attributed to the existence of the absorbing layer," he concluded.

His research was conducted in connection with the International Polar Year and was organized by the Lenin-grad Section of the Institute for Scientific Research of the People's Commissariat for Communication in association with the Central Geophysical Observatory.

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PLANT PHYSIOLOGY

Movies Show Cells "Running Backwards"

STRONG light sometimes makes plant cells run backwards. This was demonstrated before the American Society of Plant Physiologists by Dr. Joseph C. Ireland of Oklahoma A. and M. College, with motion pictures taken through a microscope.

The pictures showed the streaming motion of the protoplasm in cells of the common water plant *Elodea*. This motion normally goes clockwise, carrying with it the lens-shaped bodies of coloring matter, the plastids. But exposure to strong light sometimes caused a reversal of direction. The films also showed how degeneration and death ensue when the too-strong light was too long continued.

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PHYSICS

Research Upholds Idea of Energy Changing Into Matter

British Experiments Producing Positrons Demonstrate What Relativity Theory Considered Theoretically Possible

THE MANUFACTURE of matter out of energy, theoretically possible according to Einstein's theory of relativity, is demonstrated by experiments in which positrons, the new building blocks of matter, are produced.

To the Royal Society in London Drs. J. Chadwick, P. M. S. Blackett and G. Occhialini of Cavendish Laboratory, Cambridge, reported that their observations of the energy of positrons produced in gamma ray bombardment confirm the idea that the interaction of a gamma ray with an atom always produces an electron simultaneously with a positron and that both of these particles have the same mass.

While the artificial radioactivity discovered by the Joliot in Paris a few weeks ago (*SNL*, Feb. 10, '34, p. 83; Mar. 3 p. 133) may show that the positrons ejected from disintegrating atomic hearts are contained in these atoms themselves, the Cambridge physicists' experiments by three bombardment methods seem to confirm that the twin electrons are created from radiant energy in the field of influence of the atom outside its nucleus.

If atomic nuclei permanently contain positrons, remarked Dr. Blackett, the positrons must be "inoculated" in some manner against annihilation. Perhaps this is accomplished by a closer union with some other particle. Normally the positron, almost immediately that it is created, combines with an electron to form radiation.

Dr. G. Temple, professor of mathematics at London University, presented the first quantum theory of the neutron, which was developed by squaring the Dirac equation, which was so useful in predicting the positron before it was discovered. He followed the method of Sir Arthur Eddington, although there is an admitted theoretical drawback, since the Dirac analysis was directed to a linear equation. But Prof. Temple added no arbitrary constants.

One set of solutions of the new equation yielded results referring to the

ordinary hydrogen atom and another set referred to the neutron. The equation gave the effective radius and binding energy of the neutron which agrees well with Dr. Chadwick's estimates.

The quantum theory at present fails to explain why all hydrogen atoms do not collapse into neutrons. This is partially explained by Prof. Temple's wave equations which indicate that hydrogen is in such a state as to permit no transitions to take place.

Science News Letter, March 17, 1934

ZOOLOGY

Bitten 13 Times, Black Johannes Fears No Snake

See Front Cover

ST. PATRICK was probably not even a legendary name to black Johannes, at least until he left his native Basuto village and came to the white man's town to be "king" at the Port Elizabeth Snake Park. But if the great space-time gap that separates ancient Ireland from modern South Africa could be bridged, Caucasian Patrick and Negro Johannes might find at least one congenial topic in common.

For black Johannes has no fear whatever of snakes, is a veritable genius at handling them, and appears to be quite immune to the venom of the deadliest of them, although he has been bitten thirteen times. Visitors at the park get a shuddering thrill out of watching him drape an assortment of South Africa's wickedest serpents all over himself, with no ill consequences.

On the cover of this issue of the *SCIENCE NEWS LETTER*, Johannes is shown in such a pose. The snake most prominently displayed is an African puff adder, one of the most poisonous and at the same time most widely distributed of African serpents. The head of a second puff adder shows alongside that of its companion.

Johannes' duties at the snake park are manifold. He cares for the delicate

species, picks out the ailing ones for hospitalization, forcibly feeds the sulkers that refuse to eat in captivity, and in general serves as a faithful nurse to a reptile population that fluctuates from several thousands in good seasons down to only a few hundreds when winter chill reduces their numbers.

The Port Elizabeth Snake Park is maintained primarily for scientific purposes, but it has also become a great show place. Admittance fees of a shilling for adults, sixpence for children, have made it self-sustaining and have amortized a debt of ten thousand pounds contracted when it was built.

Science News Letter, March 17, 1934

PLANT PATHOLOGY

Mosaic Disease Causes Crippled Pea Pods

DEFORMED pods, which add further to the destructive effects of the mosaic disease of peas, have become of considerable concern to the California grower of summer and fall peas, according to Dr. William C. Snyder of the University of California.

When the pea plant becomes infected with the virus prior to the completion of pod development, Dr. Snyder says, the pods become markedly distorted, the walls assume a rough, ridged, wrinkled condition and, as a result of the corrugations, are badly deformed and somewhat dwarfed. Pods resulting from blossoms borne on a badly diseased vine may become so badly twisted or curled as to be hardly recognizable. Such pods remain severely stunted and may produce no seed.

Science News Letter, March 17, 1934

RACE CROSSING AND HUMAN HEREDITY

an address by

Prof. M. J. Herskovits
of the Department of Sociology and Anthropology,
Northwestern University

Wednesday, March 21, at 4:30 p. m., Eastern Standard Time, over Stations of the Columbia Broadcasting System. Each week a prominent scientist speaks over the Columbia System under the auspices of Science Service.

FORESTRY

New Deal in Forestry Aims at Sustained Yield Management

National Conference Recommendations Called Emancipation Proclamation For Forest Products Industries

FOREST resource conservation was the American people's first major undertaking in a planned social program, our first reversal of the complete and untrammelled individualism which had always been regarded as the dominant note in the American tradition. As a popular movement, it was already at least a generation old when President Roosevelt was inaugurated a year ago. Foresters and economists had become acutely aware of our dwindling woodland resources during the last years of the nineteenth century, and the necessity for doing something about it had been effectively propagandized into the popular will at the beginning of the twentieth, especially under the leadership of Theodore Roosevelt and Gifford Pinchot.

So far as the publicly owned forest lands, National and State, were concerned, the New Deal found itself largely anticipated by the U. S. Forest Service and the several state forestry departments. Without pretending that all problems of public forest management had been solved, the claim could none the less be fairly established that substantial progress in the right direction was being made. Further, it could hardly be denied that some of the difficulties of public forest administration were at least in part due to the chaos resulting from unplanned, unchecked individualism in privately owned forest lands, in privately managed timber and wood products industries, and in such intimately contacting private enterprises as stock grazing and farming.

To bring some order out of this situation, a conference of the lumber and timber products industries was called, under the chairmanship of Secretary of Agriculture Wallace. This conference brought together representatives of the U. S. Forest Service and other public agencies charged with the care of forest lands, several groups of professional foresters, the U. S. Chamber of Commerce, and the lumber and timber, pulp and paper, and naval stores industries.

Their report may be looked upon as almost an Emancipation Proclamation for industries dependent upon forests.

"Sustained yield forest management" sums up in four words the New Deal for American forests; the abandonment of forests as mines to be exhausted, the discovery of forests as "farms" to be intelligently cultivated.

The end sought, though stateable in a single simple phrase, "sustained yield," is not so simply attained. Many problems, some inherent in the nature of forests, some economic, some involving the human equation, must be solved and their answers reconciled. The conference undertook to do this, at least in

outline, in such a way as to include even the individual farmers' timber lots, as well as the huge holdings of private lumber companies and the great state and National forests.

The recommendations of the conference are contained in no less than 46 sections, beginning with the combating of fire, insects, disease and other natural forces of destruction, and carrying through to suggested sources of funds for the prosecution of new lines of research in the forests. Outstanding suggestions include: consolidation of administration of publicly owned forests, elimination of unnecessary competition in marketing between public and private forests, vigorous pursuit of the present policy of adding to public forests by purchase of new lands, adjustment of tax burdens on private forest lands to encourage rational rather than forced marketing, Federal organization of credits, increased protection against fire, etc., establishment of sound lumber specifications, increased appropriations for administration, education and research.

Science News Letter, March 17, 1934

ARCHAEOLOGY

Chickens Were Known in Old Testament Days, Art Reveals

IN OLD TESTAMENT times, the people in Palestine did have chickens.

This frequently raised question of Biblical bird lore is settled at last by the fine picture of a cock, found in the tomb of a Bible army captain, at Mizpah. The tomb is identified as that of Jaazaniah, mentioned as coming to Mizpah, II Kings, 25:23. The seal is inscribed: "Belonging to Jaazaniah, servant of the King."

Prof. William F. Bade of the Pacific School of Religion discovered the seal while excavating ruins of Tell en-Nasbeh which he has identified as the Biblical Mizpah, scene of many Bible events.

Reports of the cock's picture and the personal seal of the Bible soldier have aroused considerable interest among Bible historians, Prof. Bade said, and he has received many letters.

"No domestic chickens are mentioned in the Old Testament literature," he explained, "a fact which has sometimes been alleged for the view that chickens

were unknown in Palestine until New Testament times. The seal is proof positive that they were known in Palestine at least as early as the seventh century B.C."

Chickens are believed to have first come to Palestine from India, by way of Babylonia and other intermediate countries.

The seal is also cited by Prof. Bade as clinching evidence that the mound he is excavating is the real Mizpah. Various places have been named as the Bible Mizpah, where Samuel judged, where Saul was chosen king by sacred lot, and where the capital of Judah was established after Jerusalem was destroyed in 585 B.C. The Bible record tells of Jaazaniah going to Mizpah to offer fealty to the governor of Judah appointed by the Chaldean conqueror. There Jaazaniah must have died, for the seal is pronounced a very personal belonging which would have remained with him, even after death.

Science News Letter, March 17, 1934

GEOLOGY

Fossils Tell of Ancient Palestinian Climates

PALESTINE, Bible land "flowing with milk and honey," has been an entirely different sort of country in ages of the past, anthropologists report from studying bones of animals that inhabited the land.

Four or five thousand years before the Children of Israel came seeking their Promised Land, Palestine had a dry climate and was mainly desert. Earlier, in the Aurignacian period of the Old Stone Age, the Palestine landscape was wooded, though gradually developing open spaces. Still earlier, in the latter part of the Mousterian period—the age of the uncouth, clumsy Neandertal men—the land of Palestine was heavily wooded, due to heavy rainfall. In the first part of the Mousterian, Palestine was a warm and pleasant land with large rivers and hills clad with forest.

These suggestions are made by Miss Dorothy Garrod, British anthropologist, and Theodore McCown of Berkeley, Calif., as a result of their examinations of deposits which they excavated as members of the joint expedition to the neighborhood of Mt. Carmel from the American School of Prehistoric Studies and the British School of Archaeology in Jerusalem.

In the deposits of the Mousterian period they found fossils of rhinoceros, hippopotamus, crocodile and wart-hog, indicating that the climate was subtropical or tropical. Fossils of other species such as deer suggested the topography.

Science News Letter, March 17, 1934

ARCHAEOLOGY

Children's Bones May Reveal Sacrifice

THE RITE of child sacrifice may have been one of the darker scenes of life in the prehistoric Mexican city of Monte Alban. At least, so it appears from the arrangements of Tomb Forty-three which Mexican archaeologists have just explored. Dr. Alfonso Caso pronounces the tomb one of the most important finds he has made on the mountain-top.

The adult owner of the tomb was found stretched the full length of the floor. At his feet were the sets of bones of two children, not buried as whole corpses. There were bones of birds, too, and small animals.

By the head of the adult Indian lay a

pair of jade-plated earrings, which are as unusual objects as any ever found in any archaeological excavation. They are spool-shaped stone objects, with a jade plating so thin and perfectly fitting that it looks to be poured on. Its manufacture is a mystery. It is as if those ancients had racked their brains to find out what thing might be the most difficult of all to fabricate.

The Indian of this tomb may have had some relation to a rain or water cult. Nearly a hundred pottery vessels were brought into his tomb, and they represent seashells, ducks, frogs, half-gourds such as Mexican Indians still use for drinking, and double peanut-shaped ones such as make modern Indian canteens.

Science News Letter, March 17, 1934

PHYSIOLOGY

Heavy Water in Body May Cause Old Age

TOO MUCH heavy water in the body. That is the latest theory of the cause of old age and senility.

Drs. Ingo W. D. Hackh and E. H. Westling of the College of Physicians and Surgeons School of Dentistry in San Francisco, have communicated to *Science* the suggestion that the tragedy of growing old is linked to a peculiar property of heavy water, the hydrogen of which consisted of the double-weight hydrogen isotope known as deuterium. Chemical laboratories throughout the world are vigorously experimenting with heavy water.

Heavy water has a higher boiling point than ordinary water, 101.42 degrees on the Centigrade scale instead of an even 100 degrees. Experiments have also shown that heavy water inhibits the growth of seedlings, and Drs. Hackh and Westling believe this indicates that it has an inhibitory effect upon the normal functioning of protoplasm of which the human body and other animal bodies is largely composed.

Because the human body evaporates a large portion of the water that it consumes, it will in the course of years become enriched with heavy water. The light water, evaporating at a lower temperature, leaves the body more readily than the heavy water.

The San Francisco scientists conclude that "this increase in the proportion of heavy water in the body fluids may account for the increasing inhibitory action of the protoplasm during senility."

Science News Letter, March 17, 1934

IN SCIENCE

CHEMISTRY

Twin of Ordinary Hydrogen Now Found to Be Twins

HEAVERY hydrogen, the double weight twin of ordinary hydrogen, now is itself proved to be twins.

From the Colloid Science Laboratory, Cambridge University, England, Drs. Adalbert Farkas, Ladislaus Farkas and Paul Harteck have cabled *Science* that they have succeeded in showing the para-ortho conversion of deuterium using the thermo-conductivity method.

Parahydrogen and orthohydrogen of the ordinary, lightweight variety of mass one were experimentally demonstrated just a short time before the discovery of the heavy isotope of hydrogen. The para and ortho forms are concerned with the arrangement of atoms in the molecule and do not indicate difference in weights. Deuterium has two atoms in its molecule just as does protium, the lightweight mass one hydrogen.

Science News Letter, March 17, 1934

ENTOMOLOGY

New Variety of Wheat Not Liked By Grasshoppers

GRASSHOPPERS, which have been making unusual pests of themselves in the Wheat Belt during the past few summers, are expected to be "highly insult" when they hit fields of the new wheat variety known as "Ceres." Dr. L. R. Waldron, plant breeder of the North Dakota agricultural experiment station, has received letters from many farmers, agreeing that for some reason as yet unknown Ceres wheat is not liked by the 'hoppers. Due to this 'hopper-resistant quality, Ceres is said to have outyielded other Dakota bread wheats by as much as thirty per cent. during the recent grasshopper years.

Ceres was originally bred with the special objective of getting a drought-resistant, rust-resistant, high-yield wheat. Its unpalatability to 'hoppers appears to have been uncalculated—but welcome, nevertheless.

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SCIENCE FIELDS

MEDICINE

Cut Nerve Shows "Polio" Enters Body Through Nose

WHEN the olfactory nerve is cut, infantile paralysis fails to develop even after the causative virus of the disease has been placed inside the nostrils of a susceptible monkey.

This fresh evidence that the disease enters the body via the nerve of smell was obtained from investigation carried out by Drs. Maurice Brodie and Arthur R. Elvidge at New York University and Bellevue Medical School and McGill University, Montreal. The experiments are reported in *Science*.

Like other investigators, Drs. Brodie and Elvidge found that monkeys promptly developed the disease when the virus was placed inside the nose or swabbed on the membranes lining the nostrils. Examination of the olfactory nerves of such animals has shown the presence of the virus in the nerve, indicating that this is the route of the virus to the brain. But when the olfactory nerve was cut, the virus apparently could not find its way to the brain, since the monkeys in these cases remained healthy and free from paralysis.

Science News Letter, March 17, 1934

PHYSIOLOGY

Lack of Oxygen Not Always Cause of Unconsciousness

LACK of oxygen in the brain does not of itself account for fainting and other types of unconsciousness, Drs. Frederick A. Gibbs and William G. Lennox, of Harvard Medical School, reported to the American Association for the Advancement of Science.

Patients subject to fainting and epileptic seizures, and cases of sleep, both normal and pathological, were studied by these investigators, who measured with a special thermo-electric device the flow of blood through the brain under these conditions.

"In most cases of fainting, unconsciousness was preceded by a decrease in the flow of blood leaving the brain," they reported. "But in other conditions

this was not true; there was no decrease in flow just before the patient had a seizure or fell asleep.

"Even in cases in which unconsciousness occurred coincidentally with a slowing in blood flow, the decrease in flow did not seem sufficient in itself to cause any great decrease in the blood and oxygen supply to the higher brain centers.

"Insufficient oxygen supply to the brain, if sufficiently severe and prolonged, can undoubtedly produce unconsciousness," they concluded. "The fact, however, that unconsciousness can occur without significant decrease in the blood flow through the brain suggests the presence of some mechanism other than anoxemia (oxygen deficiency) by which the activity of the higher centers is abolished."

Science News Letter, March 17, 1934

ASTRONOMY

Jupiter Approaches Spica For Second Time This Year

THE SECOND of three close approaches that the planet Jupiter makes this year to the bright star Spica, in the constellation of Virgo, the virgin, occurred on Tuesday, March 13.

Jupiter is the bright planet that can now be seen low in the eastern sky late in the evening, and Spica is the star just south of it. The planet is the brighter, and it can readily be distinguished by its steady glow, different from the twinkling light of the star. On Tuesday, Jupiter was about four degrees, or about eight times the apparent diameter of the full moon, to the north.

A similar close approach of the two objects happened on January 5, while the planet was moving eastward.

On February 7, it stopped and then started a westward journey. This is called the retrograde motion, and is really due to the fact that the earth is now passing Jupiter on the same side of the sun, about which all the planets are revolving in the same direction. Because we are travelling at a speed of about 18.5 miles a second, some ten miles a second faster than Jupiter, the earth is leaving that planet behind, and it seems to be moving backwards.

By June 11, the earth will be far enough around in its orbit, that Jupiter will again seem stationary. After that it will move eastward again, and will pass Spica for the third time on August 31. Spica is a star, a body like our sun, only far more distant.

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OPTICS

Contact Eyeglasses May Partially Restore Sight

INDIVIDUALS afflicted with exceedingly poor eyesight may sometimes find the new contact eyeglasses now made by Carl Zeiss an inestimable boon. Prof. J. P. C. Southall of Columbia University, an authority on optics, expressed this opinion in reviewing a treatise on contact eye glasses by Dr. L. Heine, a pioneer in the field.

The improved form is a thin shell of glass ground and polished inside and out and inserted under the eyelid over the exposed part of the eyeball. The total weight is less than a fiftieth of an ounce. Tear fluid or salt solution holds it firmly in place and separates it from the sensitive cornea. It turns freely and easily with the eye and is practically invisible. Prof. Southall pronounces it "more apt to be comely and pleasing than otherwise."

The principle of contact eye glasses is that they substitute the almost perfect glass surface for the front of the cornea which is often so irregular that distinct vision is out of the question.

Dr. Heine said that a nearly blind clergyman thought a miracle had been performed when, after contact glasses were inserted without his knowing it, he opened his eyes and saw clearly.

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SEISMOLOGY

Earthquakes Shake San Salvador and Utah

THE EARTHQUAKE that agitated seismographs on Wednesday afternoon, March 7, was centered in the region of San Salvador and may have been felt near the northern border of Nicaragua, experts of the U. S. Coast and Geodetic Survey determined from seismograph reports gathered telegraphically by Science Service. The disturbance was not severe. The geographical coordinates of the epicenter were 13 degrees North and 88 degrees West. The time of origin was 5:41.6 p. m. E. S. T.

Salt Lake City's earthquake of Monday, March 12, apparently centered in the Wasatch mountains, to the east of the city. This provisional epicenter was worked out as approximately 41.5 degrees north latitude, 111.5 degrees west longitude. The time of origin was 10:05.4 a. m., E.S.T.

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MATHEMATICS

Mathematical Measure For Art

With Formula and Geometric Form You May Analyze The Source of Your Delight in Painting and Poetry

By MARJORIE VAN DE WATER

WHY IS IT that men throughout countless ages have taken joy in looking on the moon, a shapely tree, a pearl, or the rhythmical curves of a woman's form?

The secret of this universal aesthetic pleasure in lovely forms lies in mathematics, a Harvard professor of that science, Dr. George D. Birkhoff, tells us. Indeed, he has worked out a mathematical formula from which he can obtain the "aesthetic value" of a shape or form, and this mathematical expression of the beauty of an object conforms to the emotional judgment of those who look upon it.

Not that you need to be a mathematician to appreciate the beautiful. Not at all! It is not necessary to be able to add two and two. Neither is it necessary for you to understand why an object appeals to you as lovely. You needn't say to yourself as you look at the moon, "How symmetrical!" You are perhaps more likely to say with the poet Omar Khayyan, "O Moon of my delight!"

In fact, Dr. Birkhoff says that an intuitive appreciation is better than any attempt to analyze the source of your delight. Nevertheless, that pleasure is due to an unconscious appreciation of the mathematical proportions of the object.

You may not realize it, but the pretty girl is pretty because all her measurements are in the correct relation to each other—if her arms were longer, or her nose shorter, or her height just a little different in relation to her weight, the effect would not be at all the same. Yet you need no tape lines to tell you this. Your ability to perceive these mathematical relations at a glance, without even giving it a deliberate thought, is what gives you your appreciation of all that is beautiful in nature, in art, and in music as well.

It is perhaps no mere coincidence that the word "figure" has a dual meaning.

This finding that beauty can be expressed, if not explained, mathematically has practical importance as well as theoretical interest. The architect need

no longer depend upon using forms and designs that have proved their artistic acceptability through generations of aesthetic judgments. He can test his creations against an objective formula as well as against his own "feeling." The designer, the potter, the commercial creator of anything dependent upon its aesthetic qualities for its success can likewise find assistance in this research.

One practical problem on which it has a direct bearing is found in the screen on which motion pictures are projected. What shape should this projected image be? In the days of silent films, the proportion of the length to the height of the screen was 4 to 3. But when sound films were introduced a part of the width of the film was used for the sound track, leaving the picture narrowed. The width of the sound picture is therefore only slightly greater than its height.

Dr. Birkhoff's research has a direct bearing on this very problem.

Good and Bad Movie Frames

The square, he has found, is the most nearly ideal of all straight-line figures. Yet that does not necessarily mean that the square would be the best shape for the motion picture.

"Any obvious numerical ratio of dimensions such as 1 to 1 or 2 to 1 is to be avoided in a picture frame, because it is often desirable that the rectangle be a purely neutral accessory, not producing irrelevant associations," Dr. Birkhoff points out.

The 2 to 1 proportion has an additional disadvantage for a picture frame because it is not well adapted to fill the circular field of effective vision.

But a rectangular form which is nearly a square, but not quite, is positively disagreeable because of the effect of ambiguity, Dr. Birkhoff has found.

The shape of the sound motion picture screen is probably too near to a square to escape this fault of ambiguity. It may seem even nearer than it is because of the fact that the eye overestimates distance up and down as compared with horizontal distances.

Interesting comparisons may be made

from the table of aesthetic measures which Dr. Birkhoff has established for various straight-line forms, and which appear in the form of a table in his new book on "Aesthetic Measure," published by the Harvard University Press.

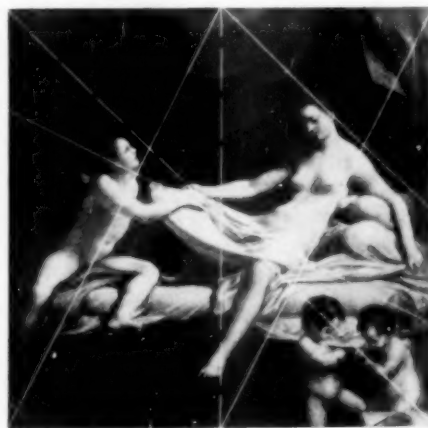
The square heads the list with a value of 1.50. Down among the zeros are a triangle and numerous irregular meaningless forms of odd shapes and proportions.

The swastika, much before the public eye today because it is the chosen symbol of the Nazi, has a value fairly low in the scale—0.33—although its aesthetic value is enhanced, Dr. Birkhoff says, by the fact that despite its notched irregular outline, the form suggests to the mind a regular pattern of horizontal and vertical lines.

A five-pointed star similar to the one appearing on the flag of the United States receives a rating of 0.90, well up near the top of the table.

Dr. Birkhoff, however, does not consider in his calculations the value attached to the symbols because of their associations, but just the aesthetic appeal of their forms. This probably accounts for the fact that although the Greek cross is high in value—0.75 and ninth in order of pleasingness—the Roman cross has a value of only 0.25.

But simple geometric forms are not the only artistic concepts that can be assigned an aesthetic value through the use of Dr. Birkhoff's formulas. He has



GEOMETRY IN ART

Correggio's painting "Danae" is marked by Dr. Birkhoff with white lines to illustrate how the composition involves geometric forms. Although not conspicuous, these forms are suggested by the principal lines of the painting.

included such creations as vases, architectural designs, melodies, and even poetry. Separate scales are, of course, used for the different types of aesthetic creations. The scale of polygons is not the same as the one for poems.

Here is how the formula for poetry

$$\text{looks: } M = \frac{O}{C} = \frac{aa+2r+2m-2ae-2ce}{C}$$

The Letter M stands for the aesthetic value of the verse, and the other letters refer to the various artistic qualities such as rhyme, rhythm, alliteration, and so on.

The letter O, which stands for Order, represents the algebraic sum of the values in the numerator of the fraction that follows. The letters aa stand for alliteration and assonance, r for rhyme, n for musical sounds. The two negative values, ae and ce are alliterative excess and excess of consonant sounds, respectively. The letter C in the denominator of the fraction means "complexity."

Counting Beauty

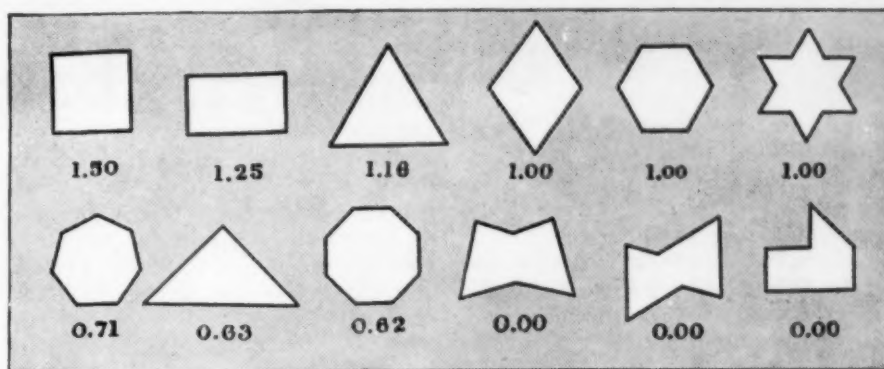
To find the aesthetic value for a poem, Dr. Birkhoff first counts the sounds which are alliterative or similar to other sounds in the same line or the line next preceding. If a sound is like more than two leading sounds in the line or more than four altogether, it is not counted, however, for an excess of alliteration is not pleasing but the reverse. Alliterative sounds are indicated by the capitals in the following line: little Boy Blue, come Blow your horn.

To this total, he adds two more points for each accented vowel sound which rhymes with the same sound in an earlier position.

Then another two points are added for each musical sound. The vowels *a* as in art, *n* as in tuneful or beauty, and *o* as in ode, are considered the musical sounds. Thus the line from Little Boy Blue is given an additional eight points on this score.

From this value is subtracted two points for each alliterative sound in excess of what is pleasing. Another deduction is made for an excess of consonants. There should be not more than two consonant sounds for each vowel sound; otherwise the line will sound harsh. Excess consonants are penalized at the rate of two points each.

When the remaining score is determined, it is then divided by another factor. This last value is obtained by counting all the sounds in the line and adding on extra points in case any two sounds come together which do not flow along smoothly, as when *b* is followed by *p* or *d* by *t*.



MEASURING THEIR BEAUTY

Some geometric forms illustrating the scale of values based on mathematics. The square is rated as the straight-line form having the highest esthetic appeal.

The greater the score for the pleasing, poetical qualities of alliteration, rhyme, and musical sound, in proportion to the total number of sounds in the line, the greater will be the resulting quotient which represents the aesthetic value.

Do you remember this poem by Tennyson?

"Come into the garden, Maud,
For the black bat, Night, has flown,
Come into the garden, Maud,
I am here by the gate alone,
And the Woodbine spices are wafted abroad,
And the musk of the roses blown."

That old favorite has an aesthetic value of .77, next to the highest of those measured by Dr. Birkhoff.

That children have good taste in poetry, too, is indicated by a value of .65 assigned to the nursery rhyme dear to childhood.

"Little boy blue, come blow your horn,
The sheep's in the meadow, the cow's in the corn."

The well-known hymn, "Onward Christian Soldiers," has a value of .51, and the following verse of Amy Lowell received a rating of .64.

"The white mares of the moon rush along
the sky
Beating their golden hoofs upon the glass
Heavens;
The white mares of the moon are all standing
on their hind legs
Pawing at the green porcelain doors of the
remote Heavens."

Familiarity with the mathematical formula may serve the artist as an aid in composition, as well as an objective test of the finished work of art. Dr. Birkhoff has actually tried building experimental poems and musical compositions by deliberately placing in them the elements indicated by the formula, blending them as the chemist might combine elements in synthesizing a new substance.

"This experiment was undertaken in

order to clarify my own ideas about the nature of poetic composition and to subject them to a test," Dr. Birkhoff said.

"According to the theory it was first of all necessary to start from an idea having some poetic quality."

Here is the idea chosen by Dr. Birkhoff for his experiment in applying a mathematical formula to the writing of verse:

"We may compare if we will, our bits of knowledge to luminous threads which we wind into a compact, luminescent ball. By skillful arrangement of the threads there begins to appear in the center of this ball a bright vision of concepts and laws. If now we add further irrelevant threads, the vision is obscured; and if we unwind the threads in an effort to approach the vision more intimately it becomes more and more faint, and finally disappears."

Making a Poem

"My first attempts to incorporate this idea in poetical form were very unsuccessful," Dr. Birkhoff confessed. "The chief reason for the initial lack of success seems to me now to lie in the fact that the appreciation of the idea was not sufficiently terse. The requirement of terseness is of course fundamental."

"Then one day came without apparent effort the following:

VISION

"Wind and wind the wisps of fire,
Bits of knowledge, heart's desire;
Soon within the central ball
Fiery vision will enthral."

Wind too long or strip the sphere,
See the vision disappear!"

The aesthetic value of this short poem is .62. Read it aloud and see whether it doesn't appeal to you as musical.

In similar manner has Dr. Birkhoff applied a formula to the composition of original melodies. Perhaps if "Tin

Pan Alley" learns to make use of mathematics in the grinding out of popular ballads, the pleasing qualities, as well as the originality, of the song of the moment may be increased.

"From the formal point of view, Western music stands pre-eminent by virtue of its purity and its extraordinary degree of development. In poetry there are formal elements which can be isolated and analyzed. But in poetry the meaning is of such dominant importance and so completely eludes formal analysis, that the field of poetry is not pure in the same sense. Similarly it is obvious that other aesthetic fields are inferior to music, either in purity, or else in degree of development as in the case of polygonal form. For, in the case of music, we have a succession of musical sounds, characterized by pitch and time, replete with relationships and devoid of obvious connotations. Furthermore this music has a deep and almost universal appeal."

Paintings, sculpture, and architecture, also have their own order in arrangement—order not only of design but of color as well. Dr. Birkhoff says:

"The 'complexity' of paintings is usually so considerable that they are analogous to ornamental patterns whose constituent ornaments must be appreciated one by one. However, it is decidedly interesting to remark in this connection how a fine composition is always arranged so as to be easily comprehensible."

To illustrate what he meant Dr. Birkhoff showed how, in any work of art, imaginary lines can be drawn across from point to point, following the principal lines of the composition. You will then see that the composition is made up of more or less well defined and entirely comprehensible geometric forms. The light and dark shades are also applied in such a way that they follow a certain order or plan.

Center of Interest

"There should be a natural primary center of interest in the painting and also suitable secondary centers," Dr. Birkhoff explained. "Such a primary center of interest is often taken in the central vertical line of the painting or at least near to it. The elements of order are of course taken to be the same as in the three-dimensional object represented. Finally there are the connotative elements which play a decisive part; a good painting requires a suitable subject just as much as a poem requires a poetical idea.

"The color spectrum, upon which the elements of order involving color necessarily depend, is not without interesting analogy to the gamut of musical tones. The simpler the palette is, the less will be the complexity, so that the palette should be as restricted as the subject permits. Evidently the eye appreciates the repetition of a color, a graded sequence of colors, and a balance of colors or of light and dark values about the centers of interest. All these elements of order are of definite aesthetic importance."

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A German scientist succeeded in baking a loaf of bread like ancient Egyptian specimens which had deep hollows in the center, the hollows being presumably used as bowls to hold food eaten in the bread.

PSYCHOLOGY

Repeat Again and Again the Name You Want to Remember

DO YOU easily forget the name of a person after you are introduced to him? The secret of avoiding this embarrassing fault lies in "overlearning" the name by frequent repetitions, Dr. Samuel W. Fernberger, professor of psychology at the University of Pennsylvania, said in a radio address.

"Many years ago I knew a gentleman who was noted for his ability to remember names—a characteristic which was of great value in his life as a politician," Dr. Fernberger said. "He quite frankly told me how he did it. It turned out that he did not have an exceptionally good memory at all. But he frankly and quite consciously set out to overlearn the name of anyone whom he might meet.

"When introduced to Mr. Smith, he did not merely say, 'I am glad to meet you,' but he would say, 'I am glad to meet you, Mr. Smith.' And then he would say, 'And now, Mr. Smith, what did you come to see me about?' 'No, I do not believe that I can help you there, Mr. Smith.' And so on, so that, within a few minutes conversation he had repeated the name ten or a dozen times. It was this repetition—this overlearning—which enabled him to remem-

ARCHAEOLOGY

Wheat Found in Clay From New Stone Age Hut

FRAGMENTS of clay that once went into the building of a New Stone Age hut, accidentally baked into a brick-like consistency by a chance fire, have preserved for thousands of years evidence that the neolithic farmers grew a species of wheat similar to that cultivated in the earliest fields of Egypt and Mesopotamia. Prof. Fritz Netolitzky, a Rumanian scientist, identified the plant remains after soaking the clay fragments in water and patiently picking them to pieces.

Prof. Netolitzky tells of his discovery in a report to the German scientific journal, *Forschungen und Fortschritte*. The investigation was carried on at the Wallraf-Richartz Museum, Cologne.

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ber the name, not the fact that he possessed an exceptional memory.

"One reason why there is so much forgotten is because you have not sufficiently overlearned what you want to remember. How frequently does the school child say, when he has once succeeded in spelling a word correctly, 'Well, I have that,' and then turns to something else. And if the school child stops at this point, one may expect that 40 per cent. will be forgotten by the end of 20 minutes and 75 per cent. forgotten at the end of a week."

Forming a great many interesting associations between the new idea or the new person and other ideas is another great aid to memory, Dr. Fernberger indicated.

"Be you young or be you old, if you want to remember something, repeat it over and over again, adding as many different associated ideas as you can even after you are sure that you know it," Dr. Fernberger concluded. "In this way you will probably not improve your memory but you will certainly be able to retain and to recall things ever so much better, which after all, is what is important in the practical situation."

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HISTORY OF ASTRONOMY

Egyptians Studied Astronomy With a Piece of String

THE LATEST giant telescopes trained on the stars are marvels of intricate mechanism. Even the amateur astronomer buys his small telescope or builds one as carefully as he can according to expert directions.

Looking at such things reminds Sir Flinders Petrie, England's grand old man of Egyptology, that science is so mechanized that we hardly realize how results could be obtained before artificial means were introduced.

Yet, working with sticks and strings thousands of years ago, man began his determined effort to orient himself. He wanted to know where he stood on the earth; where he was in time; what was the relationship of this world to the moving bodies in the heavens.

"The recording of time," writes Sir Flinders in the scientific journal, *Ancient Egypt and the East*, "is perhaps the most elementary matter. This was done in Egypt by cutting notches as a tally on a stick, and in Italy the years were marked by a priest driving a fresh nail into the doorpost of the temple. The divisions of the day are marked by the Egyptian peasant of today by putting a stick upright in the ground, and marking where its shadow falls. It seems probable that the scientific Egyptians of the early pyramid age had used the pendulum for time division, by the cubit of land measure, 29.157 inches, swinging 100,000 times a day."

The early observers recognized the number of days in a year by counting the days elapsing until the sun rose again in the same direction. Semitic science went wrong in reckoning lunar time by looking for the new moon at sunset. The accurate way was to measure the lunations and days between eclipses, which, Sir Flinders says, was probably the Babylonian method.

The Egyptians found the truth north, Sir Flinders believes, by hanging up a high plumb line and observing it and the pole star, always visible above the horizon, through a narrow slit. They found the true north midway between the two extreme positions of any star near the pole.

Long narrow trenches lying north and south to the east of Khufu's pyramid

were probably used by the Egyptians to determine just when a star passed the meridian, or the point directly overhead. A cord was stretched true north and south about 20 feet above the water-filled trenches, and the observation consisted in noting the instant when the reflection of the stars cut the cord.

In such ways, says Sir Flinders, astronomers made important observations without any apparatus but a piece of string. The main difficulty was in measuring time, and if the early dynasties knew the pendulum the use of it was certainly lost in after ages. The different forms of time-telling by water dropping or flowing, as a clepsydra, are too vague for any exact result, and this held man back from any exact knowledge or record except that of eclipses.

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PUBLIC HEALTH

Carbon Monoxide May Cause "Mystery" Accidents

INSIDIOUS carbon monoxide gas seeping from engines into automobiles may be the cause of many unexplained accidents. In 1933, there were 58,900 unexplained automobile accidents in which cars driven off the roadway for no apparent reason killed 3,260 persons and injured 53,240.

During tests at Hartford, Conn., conducted in cooperation with the Connecticut Motor Vehicle Department and Department of Health, air within typical "run of the road" automobiles, such as police cars, private passenger cars, busses and trucks, was examined for its carbon monoxide content.

The conclusion was that fully 7 per cent. of motor vehicles when in operation contain enough carbon monoxide to cause the collapse of occupants. There was probability of serious accidents if drivers were exposed to these dangerous atmospheres four or more hours. At least 60 per cent. of automobiles tested contained measurable quantities of the gas when in operation.

The first symptoms of carbon monoxide poisoning include headache, dizziness, smarting eyes, drowsiness and nausea, which result in slowing down of mental processes. The report of the test thus holds that the gas which comes largely from poor combustion and escapes through leaking exhaust pipes may also be partly responsible for some of several thousand accidents attributed annually to poor driving judgment.

The research, conducted by the Travelers Insurance Co. and the Cities Service Oil Co., found that it is possible for a dangerous concentration of carbon monoxide to accumulate within a car which is following another at the usual trailing distance. The gas may enter the trailing car whether its windows are open or shut.

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Excavation of the Circus Maximus, scene of spectacular chariot races in ancient Rome, may be attempted.

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PSEUDETHNOLOGY

Idea of Germanic Supremacy Ordered Stressed in Teaching

WHEN the Armistice was signed in 1918, some cynical newspaper wit remarked, "The nations will now proceed to beat their swords into plowshares, and their version of the War into the heads of their children."

Germany, losing none of its national efficiency through the advent to power of Hitler, is going that idea one better, in the new "directive principles" laid down by Minister of the Interior Frick for the guidance of history teachers in all German schools. A translation of the document is published in *Nature*.

Not merely recent history but all history; not merely history but prehistory of even the most vaguely guessed-at kind, is ordered into a single supporting skeleton for the thesis of Nordic (and hence Germanic) supremacy throughout all ages in all the virtues and valors.

Unifying systems of this kind have long been characteristic of a certain type of German philosopher. Since they have practically without exception failed to fit the facts when tested, they have one by one been discarded. But such experiences never discourage amateur speculative scientists. Indefatigable as spiders, as soon as one of their fragile webs is torn apart they promptly spin another.

A few brief quotations from the English translation will be illuminating:

"The heroic idea in its Germanic ex-

pression, associated with the idea of leadership of our own day, that is linked with the earliest models of the Germanic past, must penetrate historical instruction at all stages," Dr. Frick's proclamation says. "The heroic idea leads on directly to the heroic outlook which specifically befits us as a Germanic people, as no other does, and inspires us with ever-renewed vigor in the struggle for national self-assertion in the midst of a hostile world."

The search for the heroic race goes into remote times and lands; Nordics are found in northern Africa and in Mesopotamia as early as the fifth millennium B.C. Sumer, earliest of known civilized city-states in the Near East, is credited with having had "a former upper class of Nordic conquerors." The "Indians, Medes, Persians and Hittites" are also claimed as being "originally of Nordic stock." The pupils must have the example held before their eyes of the sad fate of these heroic peoples "who eventually declined, overwhelmed by the forces of foreign blood."

"The history of the Greeks has again to begin from Central Europe," the proclamation continues. "It must once more be insisted that it deals with our nearest racial brothers . . . The Nordic Greeks, as, conquerors, formed the aristocracy in the land." And again the admixture of Asiatic blood is blamed

for the decline.

"The history of the Nordic peoples of Italy must likewise begin in Central Europe . . . The struggle between patricians and plebeians is to be understood mainly as a racial struggle—hence too the particularly fierce resistance to the grant of the right of intermarriage to the plebeians." And yet again the non-Nordic element in the population takes the blame, this time for the Fall of Rome. And so on, through the Middle Ages and modern times.

Anthropologists and historians of other lands will meet this doctrine with either scorn or derision. But Germans, especially German school teachers, will take it seriously. They will have to.

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ANTHROPOLOGY

Scientist Urges Study Of Children's Physical Growth

STUDY of the physical measurements of the growth of a large number of individual children was urged by Dr. Ales Hrdlicka, curator of the division of physical anthropology, U. S. National Museum, in a report to the Conference on Child Development, Care, and Training, held under the auspices of the Mooseheart Laboratory for Child Research.

"These studies, as I should conceive them, would include periodical—say quarterly—observations of the utmost possible accuracy and with the best modern means, on all the physical as well as physiological conditions and changes in the life of the child; and in addition to this such measurements and other instrumental determinations as would seem most fit for supplement to the other observations," Dr. Hrdlicka said. "The information thus secured would shed light on not only the most important processes of normal development but also, which is of equal weight, on the normal variation in these processes."

"Moreover, studies of this nature, carried on quarter by quarter and year by year on the same individuals, would have much more than a mere academic or local importance. They would assist very materially in detecting defects of development in individual children and thus be of direct benefit to these. And such careful, thorough observations could not help but come to constitute standards for the American children at large, and indirectly be of benefit to all the children in this country."

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FOLKLORE

NATURE RAMBLINGS

by Frank Thone



Shamrocks and Snakes

LEGEND has woven the name of St. Patrick into a curiously jumbled odd-lot of natural history stories, most of which the great bishop of early Erin never heard about, and hardly any of which are absolutely accurate. However, nobody minds much; on the Seventeenth of March even a sassanach scientist is willing to concede a point or two for the sake of a pleasant tale.

The story that is most likely to have a core of truth in it is the one about the shamrock. Backing up the difficult doctrine of the Trinity with a trefoil leaf is just the simple kind of illustration that a nimble-minded practical psychologist might be expected to use. But nobody knows for sure just what plant the shamrock is. The ancient Irish word "seamrog," from which the modern "shamrock" is derived, means merely "three-leaf"; so any one of several clover species could claim the honor, and so could the three-leaved oxalis or wood-sorrel.

The tale that accounts for the absence of snakes from Ireland by crediting the saint with driving them all into the sea is without question wholly imaginary. It even ties up with other stories of serpent-slaying heroes of antiquity, most of them pagan. Snakes are absent from Ireland simply because the prolonged cold of the great Ice Age, that lay over northern Europe for half a million years (or maybe a million) made snakes as scarce there as they are in Baffin Land today, and in the scant hundred thousand years since the ice began its final retreat the snakes have not had time to find their way back across the rather wide barrier of salt water that separates Ireland from England. Even in the latter country, and in northern Europe generally, there are relatively few species of snakes.

The curious error that fastened upon the common white potato the misnomer of "Irish potato" is known to everybody. But that vegetable, introduced into the island to relieve the distress of the people, reduced to want after the English conquest, has just about earned its adopted name, for with the possible exception of Germany the potato has been most intensively cultivated in Ireland, where climate and soil combine to favor it.

The potato is a creature of nomenclatural misadventure, anyway. The early English botanist, John Gerard, who published the first description and picture of this Peruvian plant in 1597, got mixed up about its source and called it the "potato of Virginia," while the sweet potato, a widely distributed tropical vegetable, was listed in his book as "skyrrets of Peru." The potato owes its very name to this mistake, for the sweet potato had prior claim to the Indian name "batatas."

However, regardless of mistakes, the sons of St. Patrick got the potato, and that's what really counts.

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ENDOCRINOLOGY

Adrenal Cortex May Help Body Resist Disease

EVIDENCE that the vital cortex of the adrenal gland may play an important part in helping the body resist invading disease germs was presented by Ernest W. Blanchard of Bryn Mawr College to the American Society of Zoologists.

Work of previous investigators has shown that there may be a relation between infectious disease resistance and the cortex of the two small glands that lie atop the kidneys and are known to have many important functions.

Mr. Blanchard found that when both adrenal glands were removed from animals, there was a drop in the amount of opsonin in their blood. Opsonin is a constituent of blood serum which acts on micro-organisms to make them more liable to be engulfed by the scavenger cells of the body.

Injections of an active extract from the adrenal cortex brought the opsonin content of these animals back to normal and kept it at the normal level. Large amounts of cortical extract raised the opsonin content above the normal level in animals that had not had the adrenal glands removed.

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ASTRONOMY

Spring Begins Wednesday With Sun at Halfway Mark

HALFWAY on its journey from farthest south in the sky to farthest north, the sun will cross the equator on Wednesday, March 21, at 2:28 a. m., Eastern Standard Time. (1:28 a. m., Central Standard Time; 12:28 a. m., Mountain Standard Time; Tuesday, March 20, at 11:28 p. m., Pacific Standard Time.)

At this moment winter comes to an end, and spring commences. Astronomically this is known as the vernal equinox, and at this time the sun will be above the horizon as long as it will be below. After this date, and until the beginning of autumn next September, the days will be longer than the nights.

In the old Roman calendar, from which ours is derived, the vernal equinox marked the beginning of the year. Thus, at that time, September really was the seventh month of the year, as its name indicates, and December was the tenth. When Julius Caesar reformed the calendar in the year 45 B.C. the beginning of the year was shifted to January.

Another way of expressing what happens on the 21st is to say that at that time the sun enters the zodiacal sign of Aries, the ram. This is one of the twelve regions into which the sun's path is divided, and several thousand years ago, when they were established, they were named after the constellations through which it moves. There is a slow shift, however, which takes 25,800 years to complete, so now when the sun is in the sign of Aries, it is actually in the neighboring constellation of Pisces, the Fishes, though the stars are not visible because of the sun's glare.

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Study Nature

"Nature is the living, visible garment of God"—Goethe.

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Physics-Electricity

SIGNALS AND SPEECH IN ELECTRICAL COMMUNICATION—John Mills—*Harcourt, Brace*, 281 p., \$2. Those who use the telephone and the radio every day may have some curiosity as to what mechanisms make them sound. This book of simply written essays gives the opportunity of understanding many of the principles and philosophical aspects of the great communication systems made possible by electricity and scientific genius. Mr. Mills also allows his imagination to dip into the future in an effort to chart the progress to come.

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Pedagogy

AN INTRODUCTION TO THE TEACHING OF SCIENCE—Elliott R. Downing—*Univ. of Chicago Press*, 258 p., \$2. So many advances have been made in the science of teaching since the author's *Teaching Science in the Schools* was published eight years ago that he has felt a complete rewriting was called for, rather than simply a revision.

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Physics

PHYSICAL CONSTANTS—W. H. J. Childs—*E. P. Dutton*, 77 p., \$1.20. A small handbook in which are collected for the use of students essential physical constants and tables including fundamental units of heat, light, magnetism, electricity and sound. There are also brief mathematical tables.

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Botany

HYBRID NYMPHAEAS—G. H. P.—*Missouri Botanical Garden*, 43 p., 19 pl., 25c. This publication, constituting the February issue of the *Missouri Botanical Garden Bulletin*, is of such interest to botanists, horticulturists and water-lily fanciers as to merit special mention. The plates are in color.

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Physics

THE SUB-ATOMS—William Mayo Venable—*Williams & Wilkins*, 148 p., \$2. The author, who is consulting engineer to the Blaw Knox Company, Pittsburgh, does not agree that Newtonian mechanics has failed to elucidate atomic structure. He applies Newtonian mechanics to the interpretation of certain spectra without introducing any amendatory postulates. The atoms of the elements are found to be aggregations of smaller units, called sub-ele-

ments, in much the same way that chemical compounds are aggregations of chemical atoms. The preface says: "Those who do not wish Newtonian mechanics to be successful may find this book annoying, the writer ignorant of 'established principles' of modern physics, and not qualified by training to consider, much less to discuss such matters."

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Subsistence Farming

A LIVING FROM THE LAND—William B. Duryee—*McGraw-Hill*, xiii+189 p., \$1.50. With subsistence farming given a definite and probably highly important part in the New Deal, this book, written by the Secretary of Agriculture for the State of New Jersey, appears in most timely fashion. It is a most intensely practical treatise, too, offering the reader guidance through such rocky channels as locating the farm home, financing the venture, and building the house, as well as hints that will help to make such things as vegetable gardening, poultry raising and beekeeping actually pay for themselves.

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Philosophy

BASIC RULES OF REASON—I. A. Richards—*Kegan Paul, Trench, Trubner, London*, 138 p., 2s 6d. The elements of logic, stated in "Basic English," which in itself helps to simplify and make easier of understanding abstract ideas that frequently prevent the beginner from getting beyond the beginning. Therefore a most interesting little book.

Science News Letter, March 17, 1934

Mathematics

DIFFERENTIAL EQUATIONS—Lester R. Ford—*McGraw-Hill*, 263 p., \$2.50. A text by the assistant professor of mathematics in the Rice Institute, adequate to keep busy for a year an average college class in the subject.

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Horticulture

SMALL-FRUIT CULTURE—James S. Shoemaker—*Blakiston*, xv+434 p., \$3.50. A book that should be of use as a reference work to the practicing horticulturist, and also as a college text.

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Language

THE SYSTEM OF BASIC ENGLISH—C. K. Ogden—*Harcourt, Brace*, 320 p., \$2.50. Modern "artificial" languages, like Esperanto and the now forgotten Volapük, seem to gain ground very slowly; to become a world means of communication a language apparently needs to have the pressure of an expanding people behind it, like the colloquial Latin of the Roman provinces, or the simplified Italian that was the Lingua Franca of the medieval Levant. What Mr. Ogden has tried to do deliberately for English was done unconsciously and hence less systematically for the older international tongues. He has selected 850 words which suffice for all ordinary intercourse, and even for some very decent literary efforts. In this book he explains the system and gives examples.

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Engineering-Economics

THE TURNING WHEEL—Arthur Pound—*Doubleday, Doran*, 517 p., \$3.50. The automobile and particularly the development of General Motors, the makers of automobiles, is glorified in this story of the 1908-1933 transportation era. Beginning with a history of the pre-automobile development, the story of General Motors automobiles is told beginning with the first "quality" car, the Oldsmobile. There is a chronology of important dates in the development of self-propelled vehicles. As the history of an important concern in a great American industry, this book is useful and an important contribution to technical and economic literature.

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Physics

ROMPING THROUGH PHYSICS—Otto Willi Gail—*Knopf*, 64 p., \$1.50. With sprightly illustrations and text, many of the physical laws which govern our everyday existence are explained attractively. Which is heavier, a ton of lead or a ton of iron? What would happen if a revolver could be fired in the deepest abysses of the Atlantic Ocean? How much does a flying fly weigh?

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